



## Blast Injuries: Essential Facts

### *Key Concepts*

- Bombs and explosions can cause unique patterns of injury seldom seen outside combat
- Half the initial casualties seek medical care over a one-hour period
- Most severely injured arrive after the less injured, who bypass EMS triage and go directly to the closest hospitals
- Most injuries involve multiple penetrating wounds and blunt trauma
- Confined space explosions (buildings, vehicles, mines) and explosions resulting in structural collapse lead to greater morbidity and mortality
- Primary blast injuries among survivors usually result from confined-space explosions
- Standard protocols apply for triage, trauma resuscitation, treatment, and transfer

### *Blast Injuries*

**Primary:** Injury from overpressurization force (blast wave) impacting the body surface (i.e., TM rupture, pulmonary damage, hollow viscus rupture)

**Secondary:** Injury from projectiles such as bomb fragments or flying debris (i.e., penetrating trauma, blunt trauma)

**Tertiary:** Injuries from displacement of victim by the blast wind or structural collapse (i.e., crush injuries, blunt/penetrating trauma, fractures, traumatic amputations)

**Quaternary:** Other injuries from the blast (i.e., burns, asphyxia, toxic exposures)

### *Primary Blast Injury*

#### **Lung Injury**

- Signs are usually present at initial evaluation, but may be delayed up to 48 hours
- More common among patients with skull fractures, greater than 10% BSA burns, or penetrating injury to the head or torso
- Presentation varies from scattered petechiae to confluent hemorrhages
- Suspect in anyone with dyspnea, cough, hemoptysis, or chest pain following blast
- Characteristic "butterfly" pattern produced on CXR
- Sufficient high-flow O<sub>2</sub> to prevent hypoxemia is administered via NRB mask, CPAP, or ET tube
- Fluid management is similar to that of pulmonary contusion; ensure adequate tissue perfusion, but avoid volume overload
- Endotracheal intubation mandated for massive hemoptysis, impending airway compromise, or respiratory failure
  - Selective bronchial intubation may be necessary for significant air leaks or massive hemoptysis
  - Positive pressure ventilation may result in alveolar rupture or air embolism
- Clinical signs of pneumothorax or hemothorax require prompt decompression
- Prophylactic chest tube must be considered before general anesthesia or air transport
- Air embolism can present as stroke, MI, acute abdomen, blindness, deafness, spinal cord injury, or claudication

## **Blast Injuries: Essential Facts**

(continued from previous page)

- Administer high-flow O<sub>2</sub>; prone, semi-left lateral, or left lateral positioning
- Transfer for hyperbaric O<sub>2</sub> therapy may be considered

### ***Abdominal Injury***

- Gas-filled structures are most vulnerable, especially the colon
- Presentation may include bowel perforation, hemorrhage (small petechiae to large hematomas), mesenteric shear injuries, solid organ lacerations, or testicular rupture
- Suspect in anyone with abdominal pain, nausea, vomiting, hematemesis, rectal pain, tenesmus, testicular pain, or unexplained hypovolemia
- Clinical signs can be initially subtle until acute abdomen or sepsis is advanced

### ***Ear Injury***

- Tympanic membrane is the most common primary blast injury
- Signs of ear injury are usually evident on presentation (hearing loss, tinnitus, otalgia, vertigo, bleeding from external canal, otorrhea)
- Isolated TM rupture is not a marker for morbidity

### ***Other Injury***

- Traumatic amputation of a limb is a marker for multisystem injuries
- Concussions are common and easily overlooked; symptoms of mild TBI and post-traumatic stress disorder can be similar
- Grossly contaminated wounds are candidates for delayed primary closure
- Compartment syndrome, rhabdomyolysis, and acute renal failure are associated with structural collapse, prolonged extrication, severe burns, and some poisonings
- Exposure to inhaled toxins (CO, CN, MetHgb) must be considered in industrial and terrorist explosions
- Significant percentage of survivors have serious eye injuries

### ***Disposition***

- No definitive guidelines exist for observation, admission, or discharge
- Discharge decisions depend on associated injuries
- Second- and third-trimester pregnancies should be admitted for monitoring
- Follow-up is needed for wounds; head injury; and eye, ear, and stress-related complaints
- Patients with ear injury may have tinnitus or deafness and need written instruction

For more information, visit [www.bt.cdc.gov/masscasualties](http://www.bt.cdc.gov/masscasualties),  
or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).